

Features and Benefits

ESD Tolerance IC > 7,000V
 ESD Tolerance of Fan > 15,000V
 Built-in Reverse Voltage Protection
 Built-in RFI Filter
 Power Efficient CMOS and Power MOSFET Drivers allow 400mA without overheating
 Built-in Zener Diodes Protect Outputs
 Eliminates all Fan Components
 Eliminate PC Board
 5V and 12V Operation
 High Sensitivity for switching symmetry
 Locked Rotor Shutdown

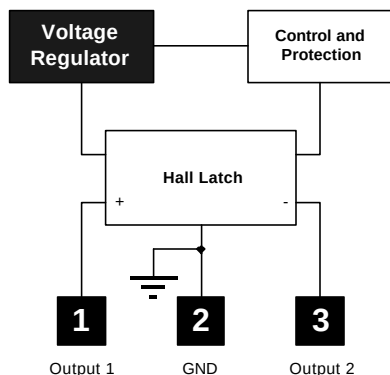
Applications

Fan Sizes up to 90mm
 Current Range up to 400mA

Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
US79	K	UA	-40°C to 125°C
US79	K	8-Pin Narrow SOIC	-40°C to 125°C

Functional Diagram



Description

The US79KUA is the most advanced Smart Fan Control Hall IC. It is designed for 5V and 12V cooling commutation. The chip contains many features to allow survival in a harsh environment. The IC was designed to eliminate all discrete components such as capacitors, resistors, transistors, diodes, PC board and associated labor, replacing US\$0.25 to US\$0.35 in direct cost.

The K rating guarantees proper operation up to an ambient temperature of 125°C. Hall IC circuitry and power FET output provide a low power dissipation cool chip.

Locked Rotor conditions are detected by the IC when there is no motion for one second and will shut off the motor drive for five seconds. Then, the IC will turn on the drive current for one second. This sequence continues indefinitely until the locked rotor condition is fixed. This feature prevents overheating. Maximum ambient temperature is determined by driver power dissipation. For instance, at 125°C ambient, driver power cannot exceed 125mW or 250mA. Future versions will offer optional features.

US79 Electrical Specifications

DC operating parameters: $T_A = 25$ to 125°C , $V_{DD} = 5.0$ to 12V unless otherwise specified.

Parameter		Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	3.7	-	18	V
Supply Current	I_{DD}	Operating	1.2	2.0	4	mA
Output leakage	I_{LEAK}	$B < B_{OP}$	-	1	10	μA
Output voltage	V_{OUT}	$B < B_{HYS}$	-	-	35	V
Output Saturation voltage	V_{DSS}	$I_{OUT} = 150\text{mA}$, $V_{DD} = 12\text{V}$		400	600	mV
Output Saturation voltage	V_{DSS}	$I_{OUT} = 350\text{mA}$, $V_{DD} = 12\text{V}$		800	1100	mV
Output On resistance	R_{DDSS}	$V_{DD} = 12\text{V}$		1.34		Ω
Thermal resistance	R_{th}	Operating			200	$^\circ\text{C/Watt}$

US79 Magnetic Specifications

DC operating parameters: $T_A = 25$ to 125°C , $V_{DD} = 5.0$ to 12V unless otherwise specified. $1\text{ mT} = 10\text{ Gauss}$.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	B_{OP}	Operating		3.0	6.0	mT
Release Point	B_{RP}	Operating	-6.0	-3.0		mT
Hysteresis	B_{HYS}	Operating	-	6.0	-	mT

General Description

The US79 eliminates 16 solder joints, protects against ESD, filters RFI emission caused by switching of high currents, protects against voltage surges, protects against locked rotor, operates at a low temperature and is manufactured in an Automotive IC factory.

Unique Features

Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is $(2 * I_{stall}/start * 0.7\text{V})$. Table 1 presents max temperature for each current.

Table 1

I_{stall} / I_{start}	T_A Maximum Rev V Test
100mA	125°C
200mA	100°C
300mA	70°C
400mA	40°C

The IC tolerates $>7000\text{V}$ ESD. When installed in the fan, the windings increase the ESD tolerance to $>15000\text{V}$ eliminating the need for ESD concerns in the finished fan. Reverse Voltage protection is provided by the motor windings. The IC contains slew rate control on the output drivers to eliminate RF emissions. 35V Zener diodes clamp the output drivers for overstress protection.

Application Comments

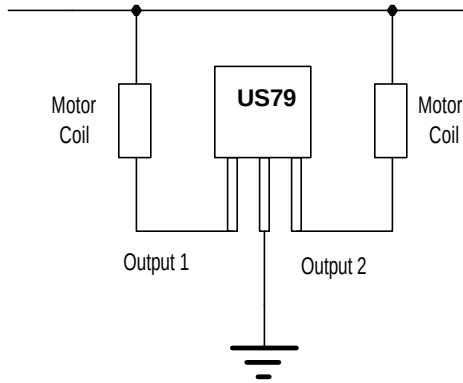
EMC protection is built in. EMC considerations require that the fan assembly should tolerate ESD, reverse voltage, over voltage and not radiate RF noise which may interfere with other electronic equipment. These capabilities are built in to the chip to meet EMC requirements.

Qualification Test Results

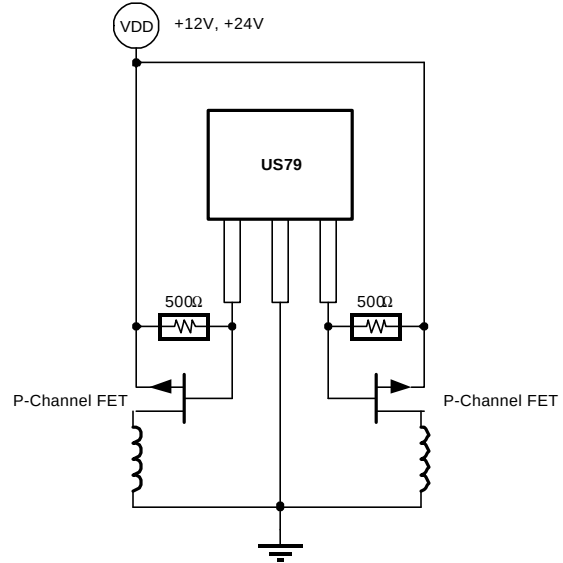
SOA (Safe Operating Area) tests to verify inductive switching of 500mA @ 20V . 1000 pieces tested 100 cycles each. Operating Life Test at $T_A = 150^\circ\text{C}$ for 4000 hrs. 100pc. "0" failures. Package qualified to QS900 automotive PPAP specifications.

US79KA Applications Schematic

5V, 12V
Supply



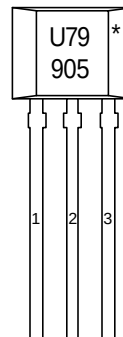
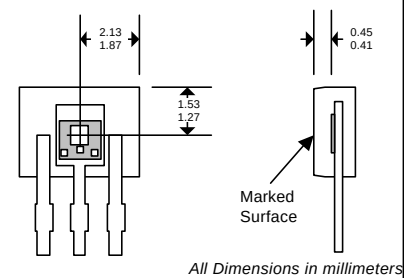
US79KA Applications Schematic for Currents Greater Than 500mA



Absolute Maximum Ratings

Supply Voltage (Over Voltage), V_{DD}	18V
Output Current (Fault), I_{OUT}	500mA
Operating Temperature Range, T_A	-40 to 125°C
Storage Temperature Range, T_S	-55 to 165°C
Maximum Junction Temp, T_J	150°C
ESD Sensitivity	+/- 7KV

US79 Hall Plate / Chip Location



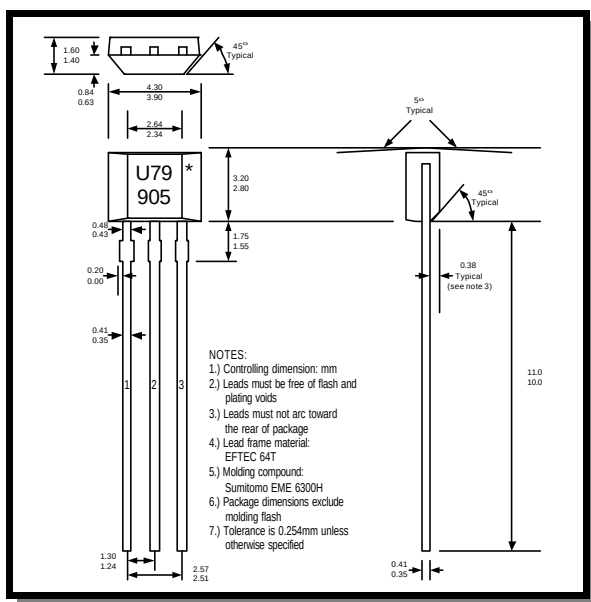
* MARKING:
Line 1:
1st digit (U) = Supplier (Melexis)
2nd and 3rd digits (79) = Series (79xx)

Line 2:
1st digit (9) = Year (1999)
2nd and 3rd digits (05) = Week of Year

PINOUT:
Pin 1 Output 1
Pin 2 GND
Pin 3 Output 2

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UA Package Dimensions



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www.melexis.com
Or for additional information, contact Melexis directly:

USA

Melexis Inc.
41 Locke Road, Concord, NH 03301
Phone: +1 603 223 2362 Fax: +1 603 223 9614
E-mail: sales_usa@melexis.com

United Kingdom

Silicon Concepts
PCB Lynchborough Road, Hampshire GU30 7SB, United Kingdom
Phone: +44 1428 751 617 Fax: +44 1428 751 603
E-mail: sales_uk@melexis.com

Germany

Am Seestern 8, 40547 Düsseldorf, Germany
Phone: +49 211 5360212 Fax: +49 211 5360250
E-mail: sales_de@melexis.com

France

Melexis France
Tour Arago, 5 rue Bellini, 92806 Puteaux-La-Défense, France.
Phone: +33 1 47 78 11 34 Fax: +33 1 47 78 06 35
E-mail: sales_france@melexis.com

Italy

Dimacred IRL
Via Papa Giovanni XXIII no. 25, 20046 Biassono, Italy
Phone: +39 039 249 4856 Fax: +39 039 491773
E-mail: sales_italy@melexis.com

Japan

Satori Electric Co., LTD
1-14-10 Shiba, Minato-Ku, Tokyo, Japan
Phone: +81 3 3452 7171 Fax: +81 3 3769 2197
E-mail: sales_japan@melexis.com

Taiwan

Beechwood Int'l Taiwan Co.
Room 8, 17F, No. 189, Taipei, Taiwan
Phone: +886 2 2739 3322 Fax: +886 2 2739 3090
E-mail: sales_taiwan@melexis.com

**8-Pin Narrow SOIC
Package Dimensions**

